

804385

SOME ASPECTS OF NORTHAIR MINES'  
BRANDYWINE PROPERTY

BY

A.H. MANIFOLD

FOR PRESENTATION AT  
THE ANNUAL MEETING OF CIM DISTRICT 6  
OCTOBER 13 - 15, 1976

TABLE OF CONTENTS

	<u>PAGE NO.</u>
ABSTRACT	1
LOCATION	2
CLIMATE AND TOPOGRAPHY	2
HISTORY	2
DEVELOPMENT	4
MILLING	7
ORE RESERVES	8
GENERAL GEOLOGY	10
BIBLIOGRAPHY	15
FIGURE 1 - GENERAL LOCATION MAP	3
FIGURE 2 - DEVELOPMENTS - SURFACE AND UNDERGROUND	5
FIGURE 3 - LONGITUDINAL SECTION: WARMAN-MANIFOLD ZONES	9
FIGURE 4 - REGIONAL GEOLOGY - CALLAGHAN CREEK AREA	11

ABSTRACT

Northair Mines' Brandywine gold-silver property is located about 70 miles north of Vancouver, B.C. To date development consists of three adits with drifting, raising and stoping proceeding on each level.

The deposit occurs in an area of volcanic rocks considered to be a roof pendant within the Coast Range Complex. The ore bodies are contained in a steeply-dipping vein-type structure varying in width from one foot to over fifteen feet and with a known lateral extent of approximately 4,000 feet. Diamond drilling indicates a vertical extent of at least 500 feet. Drifting on the lowest level shows no weakening of the structure or values.

Several geologists have considered the deposit as having a volcanogenic origin but many characteristics of a hydrothermal vein deposit are evident.

## LOCATION

The Northair Brandywine property is located 70 miles by road north of Vancouver and 35 miles from Squamish, a seaport at the head of Howe Sound. About 5 miles of gravel road connect the property to the paved Pemberton highway. Power is supplied by B.C. Hydro, the line of which also approaches within 5 miles of the property.

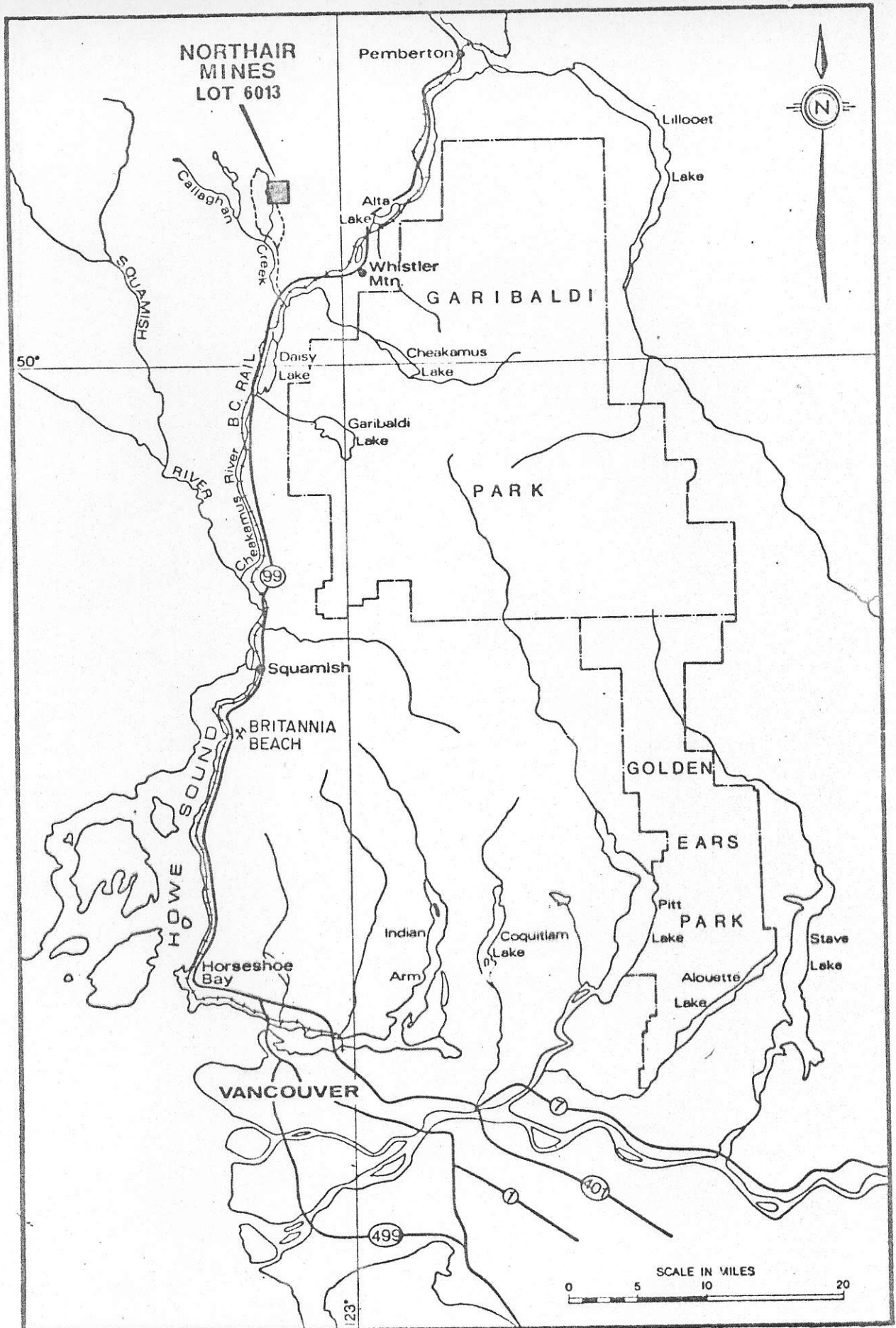
## CLIMATE AND TOPOGRAPHY

Variations in temperature are from 0 F in the winter to 80 F in the summer. Total precipitation averages 100 inches, much of which is snowfall. In the winter of 1975-76 snowfall totalled almost 70 feet.

The mine site is located on the west slope of Mount Sproatt. Elevations vary from 2,500 feet in the valley floor to about 6,000 feet at the mountain peak. The mine camp and concentrator are at an elevation of 3,200 feet. Numerous north-south depressions and cliff faces mark the west side of the mountain.

## HISTORY

The discovery of the Northair mineralized zones can be attributed to the geochemical sampling of stream silts for total heavy metal content. In the summer of 1969 a dentist, Dr. M.P. "Mike" Warshawski, while prospecting in the Brandywine area obtained an anomalous



GENERAL LOCATION MAP

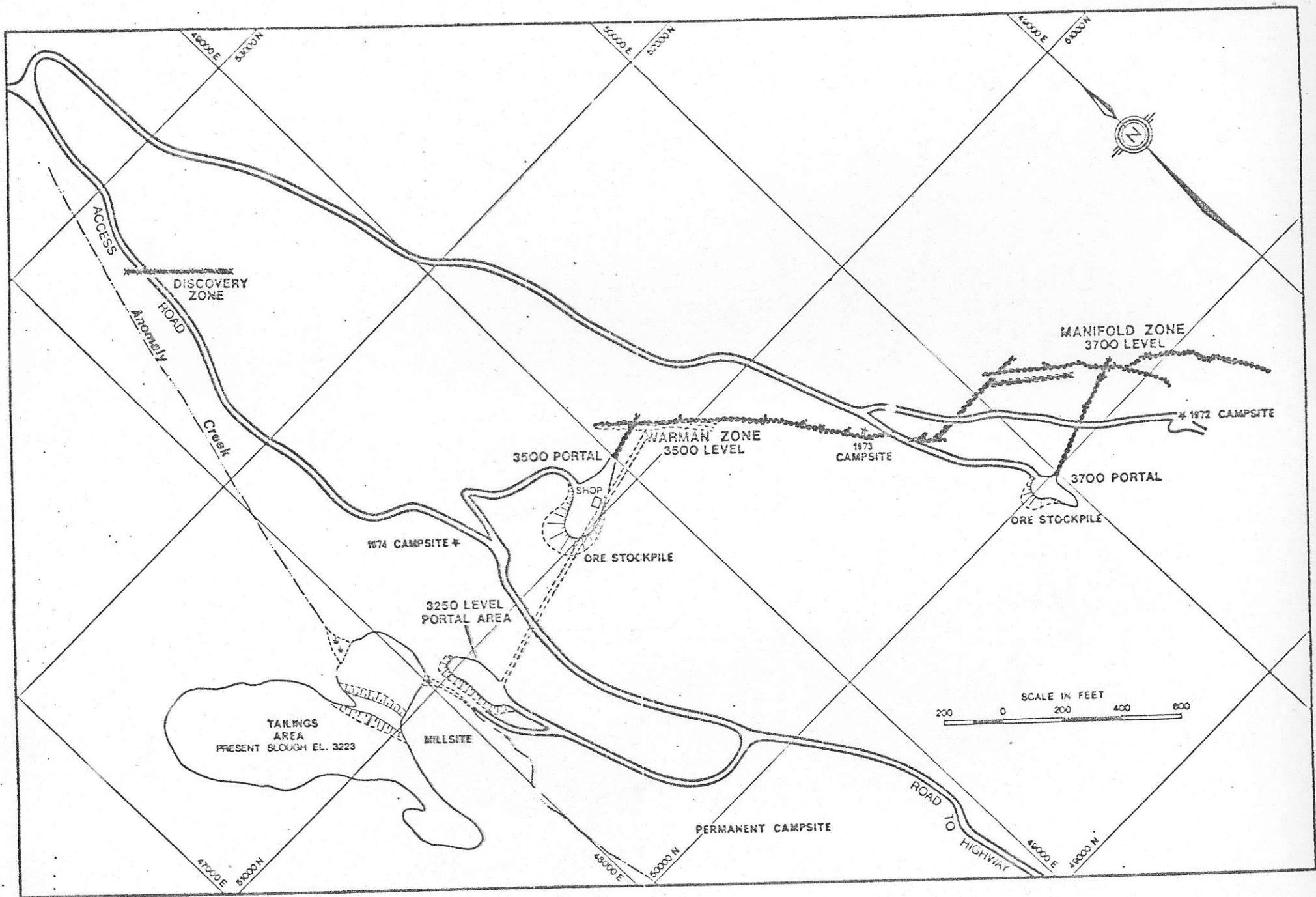
### HISTORY (continued)

reaction from the silt in a small stream now known as Anomaly Creek. Subsequent work by Dr. Warshawski and A.H. "Moose" Manifold, head of Mining Technology at the British Columbia Institute of Technology, exposed the Discovery and Manifold zones.

The property was optioned by McIntyre Procupine in 1971 and a soil sampling and trenching program was conducted in the summer season of 1972. However, the option was dropped that August. Northair Mines, with D.A. McLeod as President, then took up an option on the property and proceeded with a diamond drilling program. In the Manifold zone results were encouraging enough to warrant underground work and this commenced in the spring of 1973. Bulldozing and diamond drilling in the Discovery zone indicated a substantial tonnage of ore grade material. Late in 1973 the Warman zone was intersected by diamond drilling. An underground exploration and development program early in 1974 proved a length of over 700 feet of ore. As raising in both the Manifold and Warman zones and diamond drilling at depth indicated continuity of ore, a decision was made to proceed to production.

### DEVELOPMENT

Three mineralized zones have been located along an approximate north-west line. Starting at the south-east end extending one thousand feet to the north-west is the Manifold zone. After being



DEVELOPMENTS - SURFACE AND UNDERGROUND

DEVELOPMENT (continued)

faulted about 400 feet to the south the zone continues as the Warman zone. This zone has been drifted to the 2,500 section. The Discovery zone is located along the line at the 4,000 section. Elevations vary from 3,900 feet at the south-east end to 3,200 feet at the Discovery zone.

To date development and production has been carried on from three adits. The 3,700 adit was driven to develop the Manifold zone and the 3,500 and 3,250 adits to develop the Warman zone. All ore is by-passed to the 3,250 level, where it is trammed out of the mine to the coarse ore bin.

Shrinkage stoping is carried on in the Manifold zone where the walls are fairly stable but in the Warman zone cut-and-fill methods are used utilizing mill tailings for back-fill. However, mining experience has shown strength of walls varies and it is likely all future mining will be by cut-and-fill methods.

Start of production was June 1, 1976, with mill-feed coming from mining operations and stockpiles of broken ore from previous development. The following table gives production figures for the first three months.



DEVELOPMENT (continued)

MONTH	TONNAGE				
		Av oz./T	Ag oz./T	Pb %	Zn %
JUNE	4275	0.33	5.09	0.80	1.23
JULY	7000	0.466	2.927	1.04	1.78
AUGUST	6493	0.50	4.31	1.08	1.48

MILLING

During the tune-up period with many changes and adjustments the tonnage put through the concentrator varied considerably. A number of the difficulties have been rectified and it is now expected tonnage will be around 300 tons per day.

Both a lead concentrate and a zinc concentrate are produced. The lead concentrate is trucked to the American Smelting and Refining Company smelter at East Helena, Montana, and the zinc concentrate to the Cominco smelter at Trail, B.C. A jig is used in the circuit following the ball mill discharge and from the jig concentrate gold-silver bars in the ratio 60:40 gold to silver are produced. It is expected about one-third to one-half of the gold production of the mine will be in these bars. Approximately 80 percent of the remaining gold and most of the silver reports to the lead concentrate.

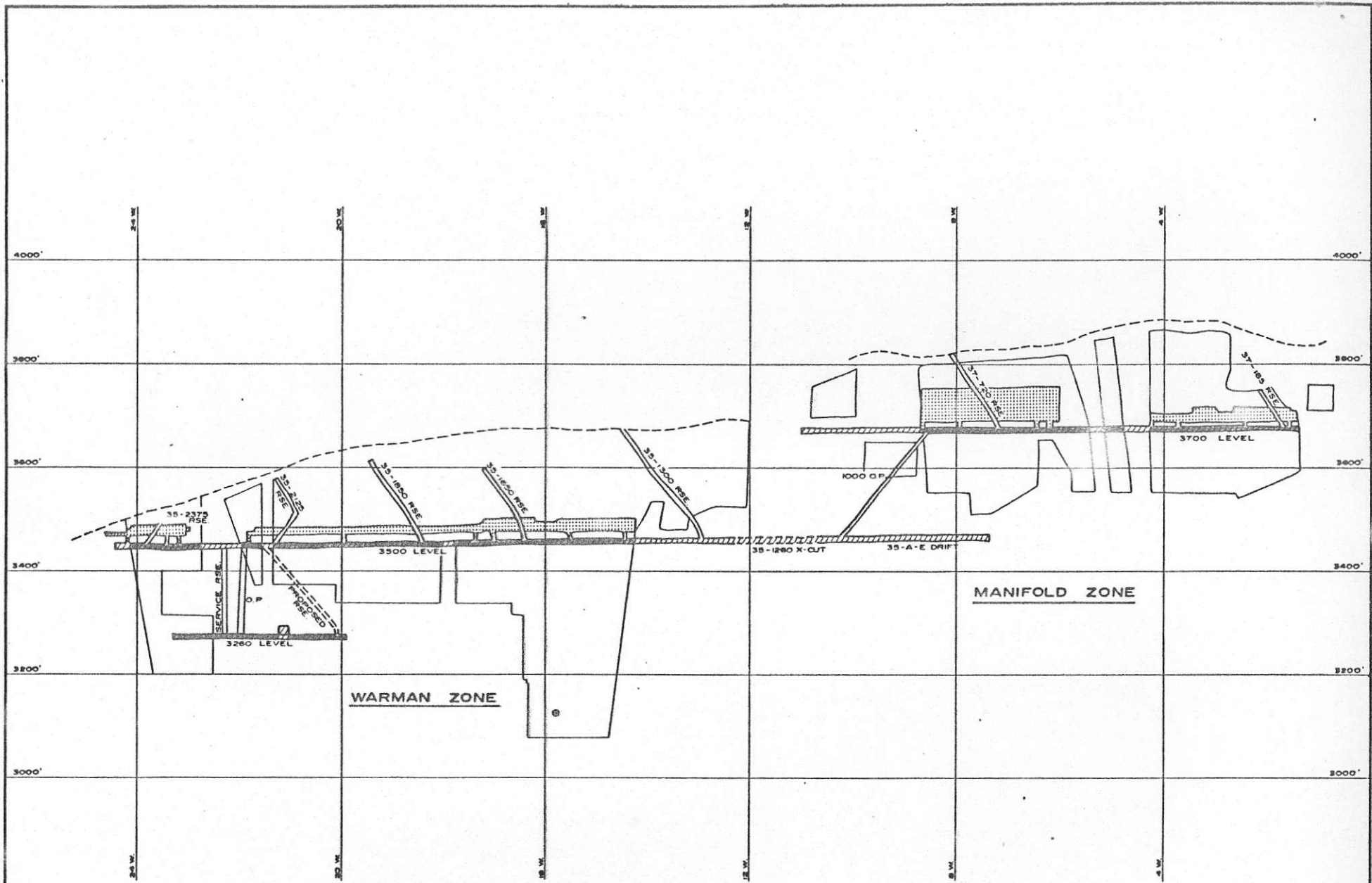
ORE RESERVES

Ore reserves calculated for the Warman and Manifold zones from underground development and diamond drilling and for the Discovery zone from diamond drilling alone are as follows:

ZONE	TONS	AV. WIDTH - FT.	Au oz/T	Ag oz/T	% Cu	% Pb	% Zn
Manifold	79,700	5.9	0.28	14.48	0.07	0.28	0.57
Warman	208,300	8.3	0.68	0.85	0.24	1.45	2.39
Discovery	121,800	17.4	0.10	1.18	0.55	5.43	6.58

To date total length of ore drifted on the Warman 3,250 level is 376 feet averaging with dilution 0.85 oz/T gold, 0.70 oz/T silver, 1.1% lead and 5.5% zinc, across a width of 5.5 feet. Raising from this level indicates continuity of ore to the 3,500 level. Approximately 1,500 feet of ground remains to be explored north-west to the Discovery zone. The deepest ore indicated by diamond drilling is an intersection averaging 0.57 oz/T gold, 2.1 oz/T silver, 0.54% copper, 4.45% lead and 8.65% zinc over a true width of 5.2 feet located 500 feet south-east of 3,250 level drifting at an elevation of 3,100 feet.

In general underground development has proven more and higher grade ore than indicated by diamond drill holes.



NORTHAIR MINES LTD.  
 LONGITUDINAL SECTION: WARMAN-MANIFOLD ZONES

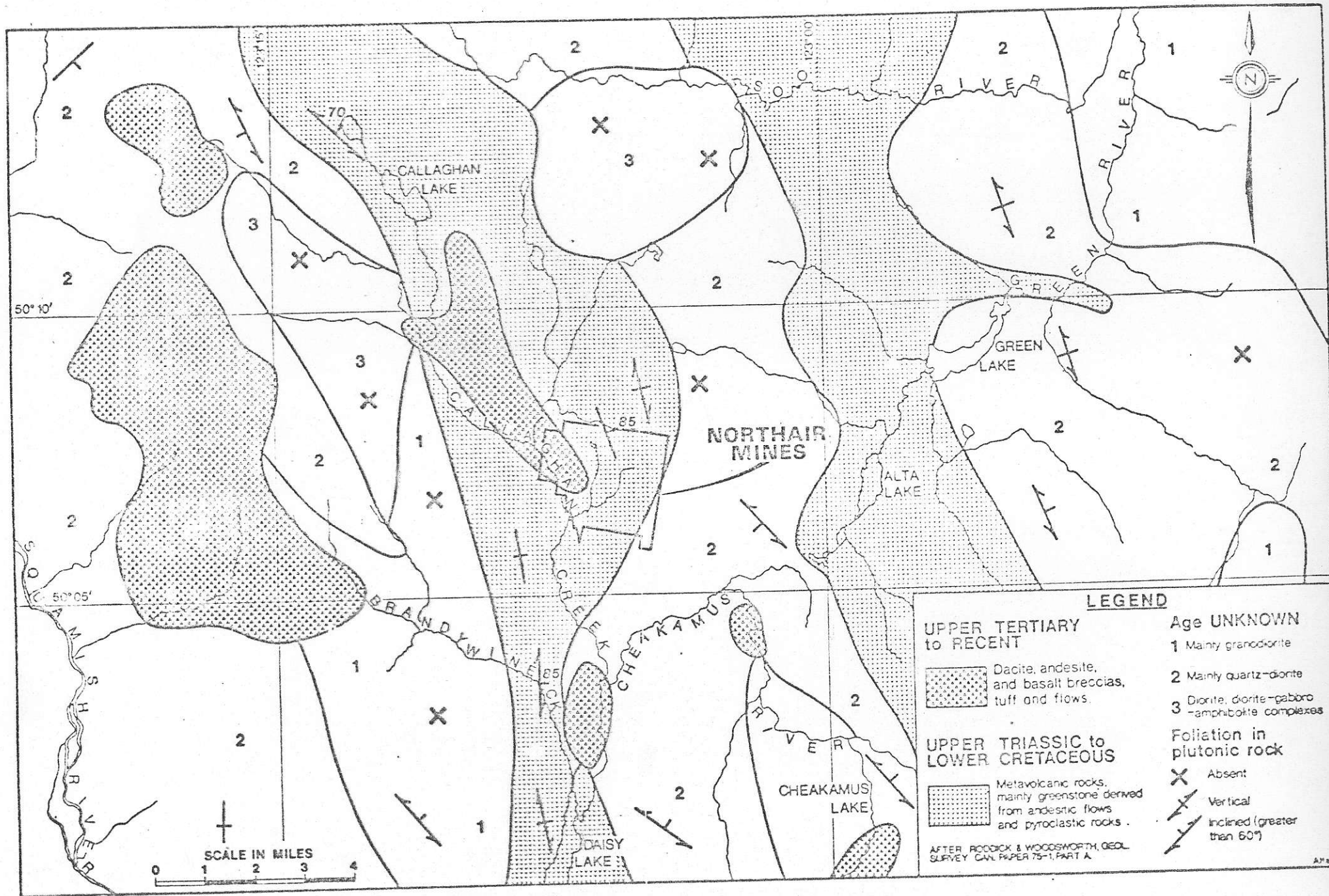
ORE RESERVES (continued)

No exploration was done during the last year outside the mining area. However, previous geochemical soil sampling indicated other anomalous areas. Diamond drill hole U-11 drilled from the end of 3,700 level crosscut intersected 275 feet in the north wall one foot of quartz-carbonate material assaying 0.09 ounces of gold and 22.3 ounces of silver per ton.

GENERAL GEOLOGY

The property lies in an area of volcanic and sedimentary rock fragments within the Coast Plutonic Complex. From just east of the junction of the Elaho and Squamish rivers north to the Bridge river are a number of occurrences of Tertiary volcanics consisting mainly of dacite, andesite and basalt breccias, tuffs and flows. Samples of rhyolite glass found within an ash member near the portal of the 3,700 level crosscut yielded a whole rock K-Ar age of about 18 million years indicating a Miocene age for the host rocks of the Northair deposits. (Dr. E.W. Grove, Geology, Exploration and Mining in British Columbia, 1974)

The ore zones and host rocks have been intruded by numerous dacitic and basaltic dykes. Also transecting the ore zones are a series of flat-lying quartz lenses some containing occasional grains of orthoclase feldspar and some sulphides. Close to the mine are



REGIONAL GEOLOGY—CALLAGHAN CREEK AREA

GENERAL GEOLOGY (continued)

occurrences of very late flat-lying basalt and about two miles north-west of the Discovery zone is an outcrop of a granitic rock of undetermined age.

The mineralized zones have a north-west trend and are practically vertical. A number of north-south faults offset the zones with the most evident being the fault separating the Manifold and Warman zones by a 400 foot left hand offset. At the north-west end of the system the Discovery zone is terminated by a north-south shear and at the south-east end the Manifold zone is also faulted.

Mineralization is generally very sparse in the Manifold zone and consists of pyrite, sphalerite, galena, chalcopyrite, argentite, stromeyerite and native gold in a quartz-carbonate gangue. Several analyses indicate while most of the carbonate is calcite some is dolomitic containing minor manganese. In some places carbonate veinlets transect quartz lenses and in other quartz veinlets transect the carbonate. Much of the gold occurs as fine veinlets and grains intimately associated with argentite and stromeyerite.

In the Warman zone sulphides are more abundant increasing to the north-west end. The occurrence of electrum has been reported in this zone. In polished sections of Warman ore pale gold was observed occurring in quartz-carbonate not associated with any particular sulphide.

GENERAL GEOLOGY (continued)

There is a definite change in metal content from south-east to north-west. Gold, lead, zinc and copper increase while silver decreases markedly. While insufficient work has been done, results to date from 3,250 level drifting indicate a decrease in lead content down from the 3,500 level. Results from the Discovery zone may be misleading as at that location there are a number of different veins in the zone. Trenching in that area revealed a ten inch high-grade rib of quartz-carbonate which may correspond to the quartz-carbonate of the Warman zone.

The following table illustrates the changes in metallic content:

ZONE	Au oz/T	Ag oz/T	% Cu	% Pb	% Zn
Manifold - south-east ore body	0.30	30.13	0.07	0.28	0.57
Manifold - north-west ore body	0.44	12.4	0.07		
Manifold - north-west end of north-west ore body	0.35	6.0			
Warman - 3,500 level	0.68	0.85	0.24	1.45	2.39
Warman - 3,500 level, north-west ore body (from raise and drift)	0.55	1.33	0.68	4.98	5.69
Warman - 3,250 level	0.85	0.70		1.1	5.5
Discovery (diamond drilling)	0.10	1.18	0.55	5.43	6.58

GENERAL GEOLOGY (continued)

As is usual with many ore deposits there is some controversy as to the type of deposit represented. Some geologists consider the deposit as being volcanogenic but in the writer's view there are more features indicating a hydrothermal origin. Following are some of the observations: (1) There are many branching veins in both walls of the zones. In the Discovery zone scattered over a width of 100 feet are numerous veins and veinlets one quarter of an inch to one foot in width containing sphalerite, galena and chalcopyrite transsecting the host volcanic rocks at various strikes and dips. (2) In 720 stope on the 3,700 level a flat-lying quartz vein in the north wall was cut off sharply at the ore body with no evidence of movement after mineralization. (3) Wall rocks change in character both laterally and vertically indicating a different strike and dip than that of the ore zones. (4) At the north-west end of the Warman zone there is a zoning from almost equal proportions of lead and zinc on the 3,500 level to a dominant proportion of zinc on the 3,250 level. This is very similar to the Hector ore bodies of United Keno Hill, Y.T.

However, work on the deposit has just started. No doubt, as more exposure of the zones is achieved future studies will present a clearer picture.



BIBLIOGRAPHY

- Chamberlain, J.A., 1973 - Report "Occurrence of Gold" to Northair Mines.
- Dickson, M.P. and McLeod, D.A., 1975 - "Northair Mines Brandywine Gold-Silver Property, Grassroots to Senior Financing"
- Pearson, D.E., 1973 - Geology, Exploration and Mining in British Columbia, 1973, B.C. Department of Mines, p. 245 - 248.
- Robinson, J.W. and Grove, E.W., 1974 - Geology, Exploration and Mining in British Columbia, 1974, B.C. Department of Mines, p. 200-202
- Roddick, J.A. and Woodsworth, G.J., 1975 - Coast Mountains Project: Pemberton (92J West Half) Map-Area, British Columbia; Geol. Surv. Can., Paper 75-1 Part A.
- Woodsworth, G.J., Pearson, David E. and Sinclair, A.J. 1976 - Metal Distribution Patterns Across the Eastern Flank of the Coast Plutonic Complex, South-Central British Columbia.